IN THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF TEXAS
CORPUS CHRISTI DIVISION

MARC VEASEY, *et al.*, Plaintiffs, v. RICK PERRY, *et al.*, Defendants.	Civil Action No. 2:13-cv-193 (NGR)
UNITED STATES OF AMERICA, Plaintiff, TEXAS LEAGUE OF YOUNG VOTERS EDUCATION FUND, *et al.*, Plaintiff-Intervenors, TEXAS ASSOCIATION OF HISPANIC COUNTY JUDGES AND COUNTY COMMISSIONERS, *et al.*, Plaintiff-Intervenors, v. STATE OF TEXAS, *et al.*, Defendants.	Civil Action No. 2:13-cv-263 (NGR)

TEXAS STATE CONFERENCE OF NAACP BRANCHES, *et al.*, Plaintiffs, v. NANDITA BERRY, *et al.*, Defendants.	Civil Action No. 2:13-cv-291 (NGR)
BELINDA ORTIZ, *et al.*, Plaintiffs, v. STATE OF TEXAS, *et al.*, Defendants	Civil Action No. 2:13-cv-348 (NGR)

REPORT OF DANIEL G. CHATMAN, Ph.D.

Declaration of Dr. Daniel G. Chatman

1. My name is Daniel G. Chatman. I am an Associate Professor of City and Regional Planning at the University of California, Berkeley. I have taught undergraduate and graduate courses in urban and regional transportation planning, transportation and land use planning, and research methods.

2. I received a B.A. degree from the University of California, Berkeley in 1991, a Master's degree in Public Policy from the Kennedy School of Government at Harvard University in 1997, and a Ph.D. in Urban Planning at the University of California, Los Angeles in 2005. From 2005 to 2009 I was Assistant Professor in the Bloustein School of Planning and Public Policy at Rutgers University, where I also served as Director and Research Director of the Alan M. Voorhees Transportation Center. I was appointed as Assistant Professor at U.C. Berkeley in 2008, and was recently promoted to Associate Professor with tenure, effective July 1, 2014.

3. I conduct research on travel behavior and the built environment, immigrants and travel in the United States, and the relationships between public transportation services and the economy. I have published 13 articles in peer reviewed scholarly journals as well as a number of book chapters, research reports, and lay articles on these topics. I have been principal investigator on transportation and land use research grants and contracts totaling about $2.5 million in funding. There are no cases in which I testified as an expert, either at trial or by deposition, in the previous four years. I am being compensated at the rate of $250 per hour.

4. I was retained to analyze the travel burdens associated with the State of Texas provision that individuals generally must present one of several approved forms of photo identification in order to cast an in-person ballot that will be counted. More specifically, I was retained to investigate the travel burdens associated with citizens of voting age who do not already hold an accepted photo ID to travel to an officially designated location to apply for and obtain a photo identification card called an Election Identification Certificate (EIC). In this report I focus on the time required to access an EIC location by car, via public transportation, or on foot, because time is the most salient and readily quantifiable of the various costs involved in travel. The main output of the analysis and of this report is an estimate of travel time burdens

across the population of all citizens of voting age, by race/ethnicity, as well as a description of different rates of poverty among the racial/ethnic groups generally and an estimate of travel time burdens among those burdened by poverty.

5. As explained in the remainder of this report, the Texas photo ID requirement for voting will place a disproportionate and significant travel burden on Blacks and Hispanics in comparison to non-Hispanic Whites. I define a travel burden as being required to travel for more than an hour and a half round trip on public transportation or on foot. Less than one percent of trips in Texas fall in this category, according to data from the National Household Travel Survey. The share of the population burdened would be from 3.5 to 4 times as high for Blacks, and about 1.5 times as high for Hispanics, as it would be for non-Hispanic Whites. The *average* round trip duration for these burdened individuals is more than two and one half hours, due to a significant number of those who would be required to travel for more than four hours round trip, most of them on foot. The share of the population that is in poverty, and for whom travel burdens are therefore particularly difficult, is also much higher among Blacks and Hispanics than among non-Hispanic Whites. Among this poorest group of citizens, Blacks are particularly likely to experience a travel burden due to the photo ID requirement, with more than a quarter of the poor Black population being required to travel for more than 90 minutes on public transportation or on foot.

6. I defined and carried out the main analytic body of this work in four parts. First, I identified a simplified set of home starting points for trips that would be undertaken by those who seek to obtain an EIC, consisting of the "centroids," or central geographical coordinates, of the 15,811 Census-defined block groups in the state of Texas. I also identified and mapped the individual office locations where EICs can be obtained (i.e., Department of Public Safety offices

and county offices) ("EIC location(s)"). Second, I estimated the time it would take to travel from home to the nearest EIC location by each of three travel modes: personal automobile, public transportation, and on foot. Third, I compiled and estimated information about the citizens of voting age (CVAs) by race/ethnicity located in the 15,811 block groups throughout the state, with a focus on those living in households without access to an auto. Fourth, I estimated the one-way travel times for CVAs by racial/ethnic group to access the nearest EIC locations to obtain a photo identification card (round trip travel times are defined simply as twice the one-way times). I describe these steps in more detail below.

7. I was assisted in geocoding, data procurement, data management, and data analysis by Nicholas Klein, Ph.D., a 2014 graduate of the Department of City and Regional Planning at Rutgers University; Jonathan Plowman, who holds a 2014 Master's degree in city planning from U.C. Berkeley; Kelly Clonts, who holds two 2013 Master's degrees from U.C. Berkeley, one in city planning and the other in civil engineering with concentration in transportation engineering; and Dylan Baker, who graduated with a Bachelor's degree in urban studies from U.C. Berkeley in 2014. These individuals were respectively compensated at the rates of $75, $40, $50, and $25 per hour for their assistance.

8. I also relied on public transportation travel time estimates provided to me by the Center for Neighborhood Technology (CNT) in Chicago, from CNT staff including Linda Young, Paul Esling, Peter Haas, Sofia Becker, and Greg Newmark. For these estimates I worked intensively with the CNT staff, and I and my assistants carried out numerous checks on the work to ensure it was consistent with third party calculations, e.g. from Google Maps in locations where it was possible to obtain publicly provided General Transit Feed Specification data (a location-based data source for public transportation routes and schedule information).

Travel burden: A definition

9. As noted above, for purposes of this investigation, I define "travel burden" in terms of time. This is based on a comparison with both national travel survey data and survey data from the state of Texas, and I present the burden (time) estimates using different approaches, which yield consistent results.

10. The time that individuals spend traveling every day varies a great deal by household, and usually is greater for those of higher income (National Household Travel Survey, 2009). In the state of Texas, among those of income greater than $20,000, the average daily time spent traveling for personal and household purposes was 73 minutes; for those making less than $20,000, the average was 66 minutes per day. These figures are slightly lower than the US averages for the same groups (see Table 1 below). A starting point for any definition of "travel burden" is the current amount of time that an individual already spends traveling each day, because this pattern typically reflects constraints that make it difficult to travel more without having financial impacts or causing time scarcity (Farber and Páez, 2011).

Table 1: Average minutes spent traveling per day, by income

	All persons	
	<$20,000	**>$20,000**
Texas	65.8	72.7
U.S. Total	66.5	75.8

Source: National Transportation Survey, 2009

11. The average trip duration for home-based trips for non-work purposes, excluding trips taken by air or intercity bus—that is, the time needed to travel from home to carry out activities such as grocery shopping, seeing the doctor, or dropping one's child off at school—was 8.0 minutes in the US and 8.2 minutes in Texas. The average time duration of a round trip is higher on both public transportation and walking than in a car, reflecting slower travel speeds

than for auto. Across all trip purposes, average trip durations for public transportation and walking are 35.7 and 14.9 minutes respectively in the US, and 38.2 and 14.4 minutes in the state of Texas (Nationwide Household Transportation Survey, 2009). Regardless of trip purpose, almost all trips in both the US and in Texas are taken by personal vehicle, due to the relatively slow speeds and incomplete spatial coverage afforded by public transportation in most parts of the US and of Texas, as well as the long distances between activity locations, and often hazardous or strenuous walking conditions, that make walking impractical. Just 1.7 percent of all trips in Texas are taken on public transportation, while 6.7 percent of all trips are taken on foot.

12. While some individuals may have time to spare for any of a number of activities, most individuals must make tradeoffs when there is any new demand on time. An increase in the amount of time required to travel can cut into discretionary time for activities like entertainment, socializing, and shopping, and then into non-discretionary time for activities like work, meals, child care, and buying groceries (Farber and Páez, 2011).

13. There are a number of burdens associated with accessing EIC locations in order to obtain an EIC, the largest and most quantifiable of which may be time. The primary burden arises from the fact that anyone who lacks the identification generally required in order to vote in person, by definition, does not have a driver's license. Therefore, in order to obtain an EIC, he or she must rely on either a ride from someone else in the household, a ride from someone else not living in the household, or an alternative travel mode such as public transportation or walking. Since there are only a few hundred EIC locations in a state of 25 million people, travel distances can be quite large. The burden is higher for those without the ability to call on another member of their household to drive them, and highest for those without familiarity with public transportation routes, with physical difficulties in walking, and so on.

14. While acknowledging the existence of a subjective aspect of travel burden that goes beyond travel *time*, the primary focus of this report is to investigate the number and share of CVAs by race/ethnicity who would undertake trips of long duration in order to obtain an EIC. Calculating the travel burden based on the amount of time required to access an EIC location does not account for the relative inconvenience and physical discomfort associated with the walking, waiting, and in-vehicle times associated with long public transportation rides; or the physical effort involved with walking all or some of the distance to the location, along routes that may be largely inhospitable to pedestrians.

15. There is some scientific literature that has translated these qualitative facts about accessing and egressing public transportation on foot into estimates of the valuation of time associated with waiting, walking, and riding on vehicles in transit, by analyzing survey data for the purpose of predicting choices between travel modes. Based on a set of 192 studies of walk time values and 77 of waiting time values, the time that people spend waiting for public transportation or walking to and from public transportation stops, is about 1.6 times as burdensome as time spent traveling in a personal vehicle (Abrantes and Wardman, 2011, Table 21). In turn, time spent riding the bus or rail is somewhat more burdensome than time spent in a personal vehicle. One quantitative figure averaging a smaller set of studies puts the value at 1.2 for the value (burden) of time spent on a bus compared to time spent in a car (Abrantes and Wardman, 2011, Table 19).

16. In addition, people of lower income can be expected to have more difficulty than people of higher income in managing to find additional time to procure an EIC. Those of lower income usually do not have the option of purchasing services to reduce time requirements in other areas, such as paying for child care, laundry service, home cleaning services, meals out, or

prepared food. Travel becomes particularly burdensome when it requires difficult choices such as whether to work fewer hours in the week (and thus to pay in dollar terms, not just in time terms); to require children to stay up later than normal in order to accommodate the lengthened schedule for that day; or to forgo a trip to the doctor that week. Because these kinds of burdens are more likely to be borne by those of lower income, but cannot be otherwise measured directly with the available data, I also analyze how access to EICs by race/ethnicity is affected by poverty status.

17. A final aspect of the analysis is to look more generally at travel time burdens across the population, regardless of particular racial/ethnic burdens.

18. For the purpose of this analysis I define a travel burden as a trip that exceeds 90 minutes, two hours, or three hours round-trip. I focus on trips on foot or via public transit, which are more onerous than trips undertaken in a private vehicle, as explained above. Less than one percent of trips in Texas exceeded 90 minutes on public transportation or on foot, according to the most recent data for Texas from the National Household Travel Survey (2009). The fact that such long trips on foot or via public transportation are so rare suggests that people avoid them whenever possible.

Starting and ending points for travel to obtain EICs

19. There are three sets of locations from which an accepted state photo identification card can be procured, consisting of permanent offices of the Department of Public Safety (DPS), where one can apply for a driver's license, Texas personal ID card, EIC, or license to carry a weapon; a set of county offices that have agreed to issue EICs; and finally a set of “mobile” offices where one may apply for an EIC. I have conducted analysis for the 226 DPS offices and 55 of the 61 county offices for which it was possible to find address data. As of the writing of this report (June 2014), the “mobile” offices have been only sporadically available to those

seeking to acquire an EIC, having been open for only a few days at a time at a limited number of locations. I therefore do not include these in the travel time estimates, as they have a very small influence on accessibility.

20. I obtained online listings of permanent DPS locations where EICs are being issued and geocoded these using ArcMap and Google maps. In addition to these 226 DPS locations, as noted above, there were another 61 county offices, serving counties whose total populations added up to 657,131 in population, which is 2.6 percent of the state population. (These counties were all outside areas served by public transportation.) Addresses were available online for 55 of the 61 county office locations. Figure 1 (below) displays the geocoded DPS and county offices on a county map of Texas.

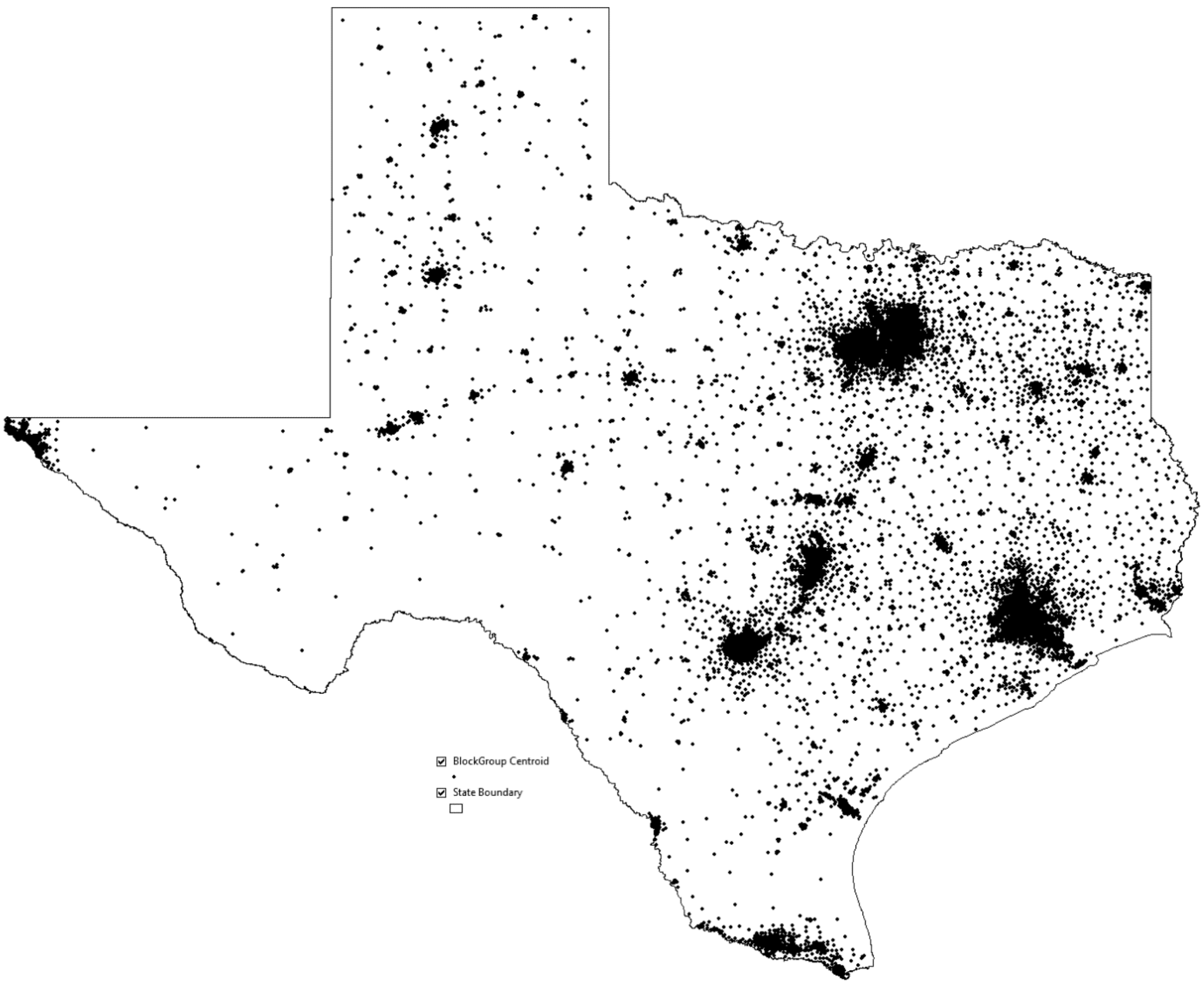
Figure 1: Geocoded DPS offices and county offices providing EICs

21. There are more than 10 million housing units in the state of Texas (U.S. Census Bureau, 2014), and therefore I used a set of simplified home locations to estimate the travel times for those who may seek to access EIC locations. These consisted of Census block groups, which typically include between 1,000 and 2,000 residents. I defined the location for all households in the block group as consisting of the centroid of the block group (the spatial center of gravity of the polygon comprising the block group). Figure 2 (below) displays the centroids, and county boundaries are also shown. Block group boundaries are not shown.

22. Figure 2 also illustrates the fact that any meaningful spatial error in identifying the locations of specific housing units is likely of most concern in locations in the outlying and

less dense parts of the state. In these locations it is more likely that travel time estimates are disproportionately inaccurate because the block group centroid may be located farther from the average household than in block groups in the most densely populated parts of the state. However, by the same token, this error exists only with regard to a small fraction of the Texas population.

Figure 2: Block group centroids (estimated home locations)



Travel times between home and EIC locations

23. For each block group centroid I estimated the travel time to the nearest EIC location, where “nearest” is defined using one of three methods depending on the mode: auto (drive), public transportation, or walking. The latter two modes are the most relevant, under the

assumption that citizens of voting age who do not hold some form of accepted photo identification are more likely to have to rely on a non-auto mode to obtain the EIC. Even without this assumption, however, the results I discuss here do not vary very much.

24. There are many possibilities to obtain data to estimate travel times, but the best estimates are based on distances along the road network, travel times on public transportation, and distances along the pedestrian network. I used network and schedule based estimates rather than more commonly calculated "zone to zone" estimates of travel time, which rely on aggregated information about trip destinations and are therefore less accurate.

Public transportation times

25. There are eight large public transportation agencies (with at least 2 million one-way trips per year) in the state of Texas serving the metropolitan areas of Austin, Corpus Christi, Dallas-Fort Worth, El Paso, Houston, Laredo, Lubbock, and San Antonio. Of these, three metropolitan regions offer rail systems. Commuter rail systems include the Capital MetroRail (Austin metropolitan area) and Trinity Railway Express (Fort Worth & Dallas commuter rail). Light rail systems in Texas include the Dallas Area Rapid Transit (DART) and Houston's METROrail. In addition to the eight large metropolitan-area public transportation agencies, there are 30 local public transportation agencies providing bus service, and nine additional agencies providing paratransit or demand–and-response based services, according to the Federal Transit Administration's National Transit Database. At least four counties within Texas do not provide any local public transportation service at all (Brewster, Hudspeth, Presidio, and Jeff Davis Counties) and some others have very little service.

26. According to the National Transit Database, 23.7 million of the 25 million in population in Texas are covered by public transportation service. However, this estimate includes the entire city population for each system, and actual public transportation accessibility in the

state is much lower. I contracted with the Center for Neighborhood Technology (CNT) in Chicago to obtain more accurate estimates of public transportation travel time for the entire state than could be calculated by using publicly available data sources. CNT is a well-known and highly respected center for the collection and dissemination of transportation and land use metrics. As noted above, I worked intensively with the CNT staff in obtaining the public transportation data, and I and my assistants carried out checks to ensure the data were consistent with third party calculations.

27. The CNT estimates rely on spatially specific information about the routes of public transportation vehicles, location of stops, and schedules. In Texas, at least four major metropolitan planning organizations make specific public transportation data available in General Transit Feed Specification (GTFS) format. The CNT staff supplemented this information with schedules that they collected and entered into GTFS format, covering an additional third of the population with some form of public transportation service in the state. These schedules were collected in different years, as far back as 2009 and as recently as 2014. Since the base population data used here are from the 2010 Decennial Census, these different years of data collection are roughly appropriate for the data. GTFS data make it possible to estimate public transportation travel times that take into account actual service frequency, scheduled public transportation times, and waiting times between buses and trains. The CNT travel information accounts for public transportation use throughout almost the entirety of the state, and for almost all Texas residents who have any access to public transportation. Finally, I carried out a separate estimation procedure to estimate walking network distances and times to the nearest transit stop, and from the final stop to the EIC location.

28. The travel time by public transportation was estimated from each block group centroid to the nearest EIC location as follows. Block groups were classified as accessible to public transportation if (1) there was at least one transit stop within one mile of the block group centroid, (2) there was scheduled public transportation service within 30 minutes of the predicted arrival time at the transit station, assuming an 8:00 am start, (3) the route could be completed with no more than two transfers, and (4) the EIC location on the other end of the trip was located within one mile of a transit stop. Studies in the US of walk distances to public transportation find steep drop-offs in the likelihood of walking to rail stations after a half mile distance, and faster drop-offs in willingness to walk to bus stations as distance decreases. There are similar steep drop-offs in usage for routes with more than two transfers being required.

29. By this definition, 6,973 of the block groups in the state (44 percent) were defined as accessible. Among the block groups defined as inaccessible, almost all—7,858, or 89 percent— had no public transportation service within a mile, and the remaining 980 block groups had various other constraints, such as too many transfers required, too long a wait time, or no EIC location within a mile of a destination transit stop.

1. **Accessible** (6,973 block groups)
   Block groups where public transport can be used to travel to an EIC location

2. **Inaccessible: Constraints** (980 block groups)
   Block groups with one or more transit stops within one mile, but for which an EIC location is not accessible via public transportation either because public transportation does not run at the origin or transfer stops within the 30 minutes of arrival, the trip would require more than 2 transfers, or there is no EIC location within a mile of a transit stop.

3. **Inaccessible: No transit stop within one mile** (7,858 block groups)
   Block groups that do not have transit stops within one mile of home.

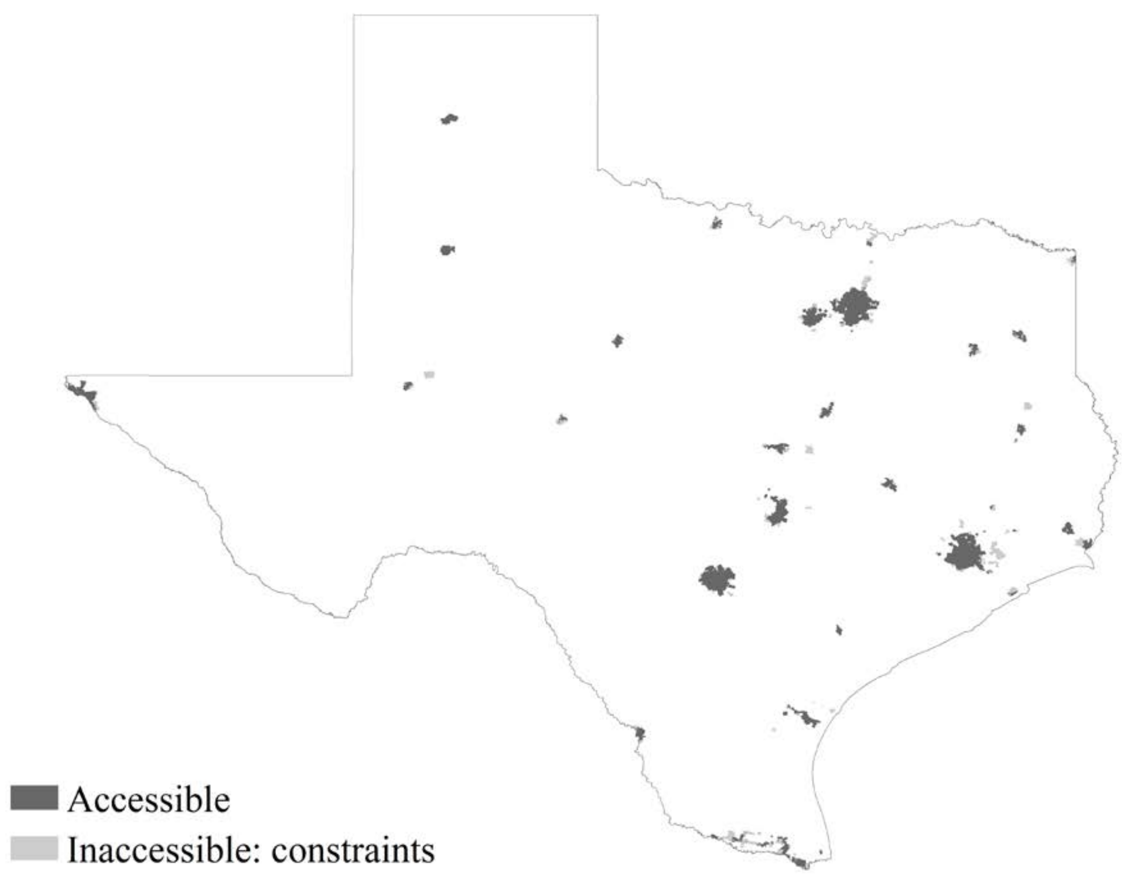
30. Table 2 below summarizes the distribution across all block groups. Note that about 40 percent of the state's population is, according to this definition, able to access an EIC location via public transit.

Table 2: Distribution of accessibility to EIC locations

	Block Groups		Population	
Category	Count	Pct	Sum	Pct
Accessible via public transportation	6,973	44%	9,955,201	40%
Inaccessible: Too many transfers required, etc.	980	6%	1,638,076	7%
Inaccessible: No transit stop within one mile	7858	50%	13,552,284	54%
Total	15,811		25,145,561	

The same information is shown spatially in Figure 3 below. Areas that are inaccessible because the nearest public transportation service is more than a mile away, are shown in white. These are the majority of the non-urban areas of the state.

Figure 3: Accessible and inaccessible block group locations



31. For every trip on public transportation, travel time includes walking to the nearest bus or rail stop from home, waiting for a bus or train, and walking from the destination stop to

the EIC location itself. These public transportation travel times assume the best case scenario of highest schedule availability and no travel delay. For example, it is assumed that everyone can travel to an EIC location on Monday morning, which is typically the highest frequency public transportation schedule, despite the fact that many people will find it difficult to travel at that time due to obligations like work. Those who travel to an EIC location during the middle of the day, or on Saturday, could encounter a much less frequent schedule than what is assumed here, and would almost never encounter a more frequent schedule.

32. For the 6,973 block groups for which public transportation travel times were calculated, the average total time to travel from home to the nearest EIC location was one hour and 15 minutes, or two and one-half hours round trip. This total trip time consisted on average of a half hour of time in the public transportation vehicle each way, a half hour of walking (both to get to the nearest stop, and to walk the remaining distance from the closest stop to the EIC location), and about 15 minutes of waiting for a public transportation vehicle. There was substantial variance. For example, ten percent of block groups with public transportation access have a one-way trip exceeding two hours to arrive at an EIC location, or more than four hours round trip. In many of these cases, walking to the nearest EIC location is faster than taking transit.

Travel times on foot

33. Using ArcMAP GIS software, I identified the shortest route to an EIC location from the geographic center of each census block group using the road network. The distance to the nearest EIC location ranged from anywhere to a few hundred feet to as far as 81 miles away, with an average distance of 7.8 miles. I calculated walk times by dividing the route distance in miles by an average walking speed of 2.2 miles per hour, a figure based on a discount of 25 percent to the standard estimate for pedestrian walking speed of three miles per hour over short

trips of one-half mile or less. The 25 percent discount accounts for the fact that walking distances to the nearest EIC location exceeded a mile in almost all instances, while the main observational study upon which the standard walk speed assumption is based comes from measured speeds of a sample of 230 adult volunteers taken over a 25-foot expanse of floor (Bohannon, 1997) . The walk time figures were estimated using both the ArcMap outputs of the distance over the shortest route, as well as the Google Maps calculation of the distance associated with the shortest time route for driving. There was relatively little difference in the estimates. This resulted in estimated walk times as long as 36 hours and as short as a few minutes.

Road travel times

34. To estimate the driving time between block group centroids and EIC locations, I used an automated batch interface for Google Maps, providing a time estimate for a standard, time-efficient route that accounted for travel delays caused by road congestion and traffic signals. The Google interface, accessed via a software add-on to Stata (the statistical software program I used), allowed queries of up to 2,500 origins and destinations at a time to calculate the driving time and distance from the geographic center of each census block group to the nearest EIC location, where "nearest" is defined from the ArcMap nearest network neighbor analysis described above under "Travel times on foot." The average distances from block group centroids to EIC locations were very similar to the pedestrian distances, and the times ranged from a few minutes to as long as 2.2 hours. The average speed of travel for these estimated trips ranged from around 5 miles per hour to around 67 miles per hour, with a median value of 32 miles per hour.

Spatial distribution of CVAs by race/ethnicity, auto ownership and poverty status

35. With regard to obtaining an accepted photo ID, the photo ID law is relevant only to those citizens of voting age who are eligible to vote and do not hold a driver's license, other accepted state photo ID, or an accepted federal form of photo identification. There currently are

no secondary data available to me to determine the locations of individuals—and therefore the travel times of those individuals—who do not hold some eligible form of photo identification, yet are either eligible to vote or are in fact registered to vote. Therefore, for the analysis presented here, I focus on estimating the locations and characteristics of several relevant populations of interest, distinguishing residents of voting age who are citizens by race/ethnicity, by auto ownership, and by poverty status.

36. For each of the three demographic Census data sets described below, I used the following racial and ethnic categories: non-Hispanic White alone; Black or African-American alone; Asian alone; and Hispanic (Latino). A small percentage of those self-reporting in the Census that their only race was Black/African-American or Asian also reported, in a separate question, that they are Hispanic/Latino (3.2 percent and 1.7 percent respectively). The remaining residents enumerated in the 2010 Census are not included in this analysis. This excluded group (making up 1.8 percent of the Texas population in the 2010 Census) did not identify as Hispanic/Latino, and either reported two or more races (1.3 percent) or some other race (0.5 percent), such as Native Hawaiian and Other Pacific Islander alone, American Indian and Alaska Native alone or Some Other Race alone.

37. Calculating the travel burden associated with accessing an EIC location requires, first, knowing how many citizens of voting age there are in each racial or ethnic group in each Census block group. I obtained block group counts of the number of residents of each race or ethnicity in each Census block group who were of voting age (18 or over) from the 2010 US Census. There are 15,811 block groups in the state. The Census is designed as a 100 percent count of every person living in the US. These are the most accurate data available for a base

count of the population by race/ethnicity and age, even though changes to the population may have occurred in the last few years.

38. The decennial Census tells us how many people of voting age there are in each racial or ethnic category in each block group, but not whether they are citizens. I used another Census Bureau data source, the 2008-2012 American Community Survey (ACS) five-year Census tract level estimates, to obtain the share of voting-age residents of each race or ethnicity who were citizens in each Census tract. There are 5,265 Census tracts in Texas, containing between one and eight block groups, with a median of three block groups. To estimate citizens of voting age by race in each block group, I first calculated the share of adults of voting age in each racial or ethnic group that are citizens in the five year sample for each Census tract. I then multiplied this ratio by the number of people of each racial or ethnic category in each block group to estimate the citizens of voting age (CVAs) by race/ethnicity in each block group (Chapa et al., 2011).

39. The American Community Survey (ACS) five-year Census tract estimates are based on a one percent sample conducted every year, and this provides a good estimate of the share of people in each racial or ethnic group that are citizens at the Census tract level. The ACS is conducted upon a sample of the population, rather than a complete count, so its estimates are subject to some error, but the five year estimates are the most precise and spatially specific available for citizenship status. Note that the ACS tract data both pre-date and post-date the year of collection of the 2010 Census data, aggregating data over a five year period.

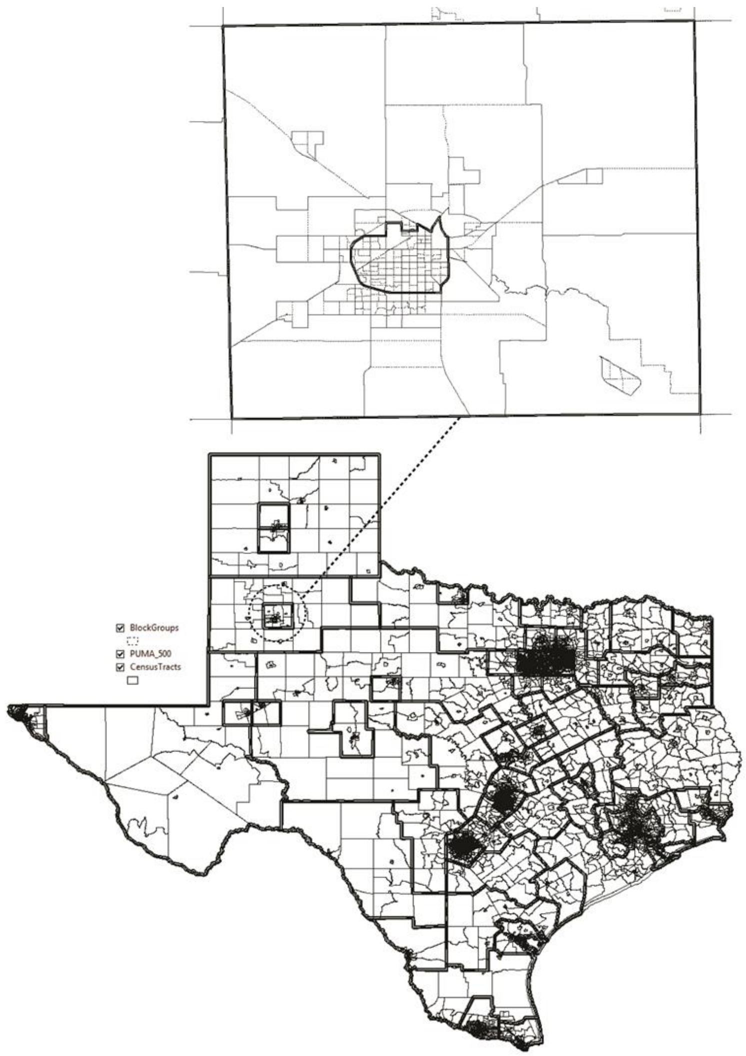
40. Because there is no generally accepted methodology for aggregating confidence intervals from the Census tract level to higher levels of geography (in this case, statewide), I simply report these estimates without confidence intervals. The very large numbers of the sample

across the state mean that the differences between Blacks and non-Hispanic Whites, and between Hispanics and non-Hispanic Whites, presented later in the report are statistically significant at the 0.001 level or better.

41. The next step was to calculate auto availability among CVAs by race/ethnicity in each block group. To do this I used data from the Census Bureau's Public Use Microdata Sample (PUMS) to calculate the share of CVAs in each racial/ethnic category who did not have access to an auto owned by their household, and multiplied that share by the number of CVAs in each racial/ethnic category in each block group contained within each Public Use Microdata Area (PUMA) (Chapa et al., 2011). No other source of Census data would permit this calculation because there are no such four-way tables publicly provided by the U.S. Census. PUMAs are areas containing between 80,000 and 120,000 people and thus containing a large number of block groups (see Figure 4 below for a spatial example in Texas). Thus the rates are applied to a number of different block groups within the PUMA which might in fact have some variance in auto ownership between each other and within the PUMA. Any such spatial variance among racial/ethnic groups of CVAs cannot be calculated and is therefore ignored here.

42. Figure 4 below displays the spatial structure of PUMAs, tracts and block groups. PUMA outlines are represented with double lines, tract outlines with single lines, and block group outlines with dashed lines. There are 153 PUMAs in Texas, with an average of about 100 block groups in each.

Figure 4: Spatial structure of PUMAs, tracts and block groups



43. I estimated travel burdens among households in poverty using PUMS data about the rate of poverty among citizens living in households with and without cars by race/ethnicity, using the variable “poverty” which reports household income as a percentile of the poverty threshold (poverty threshold is a dollar figure that varies depending on household size) . I applied these percentages to all block groups inside each PUMA to estimate the number of CVAs by race/ethnicity with and without vehicles whose reported household income was either below or above the poverty threshold.

44. I identified three methods for determining the share of CVAs in each racial/ethnic category that did and did not have access to an auto in the household, and performed the necessary calculations for each method. In the first, I calculated separate rates of auto ownership for CVAs in each ethnic group above and below the poverty threshold in each PUMA in the state, and then applied those auto ownership rates to the estimated number of CVAs by race/ethnicity who were above and below the poverty threshold in each block group contained in that PUMA.. In the second, I calculated separate rates of auto ownership for CVAs by race/ethnicity living in rented and in owned housing in the PUMA, and then carried out a similar calculation. In the third method, I did not take account of either poverty rates or home renting/owning, simply estimating the rates of auto ownership among all CVAs in each racial/ethnic category in each PUMA, and applying that ratio to the CVAs by race/ethnicity in each block group. The most accurate estimates are those taking into account the poverty rate, since one of the most important determinants of auto ownership is income. I present only that set of estimates here, but I note that the figures do not vary very much from the estimates that use housing tenure to estimate auto ownership, or those that take into account neither poverty nor housing tenure.

45. Table 3 summarizes the sources of data used to estimate the number of citizens of voting age in each block group by racial/ethnic category, with and without access to an automobile in the household.

Table 3: Data sources for estimating household automobile access

Data source	Geographic resolution	Relevant information
2010 Census	Census block groups	Voting age population by race/ethnicity; housing tenure (renting or owning one's home) by race/ethnicity
American Community Survey 2008-2012 (5-year sample)	Census tracts	Share of voting age population that are US citizens by race/ethnicity; poverty rates by race/ethnicity
Census Public Use Microdata Sample (PUMS) from the 2009-2011 American Community Survey	Public Use Microdata Areas (PUM areas)	Share in each PUM area of citizens of voting age by race/ethnicity living in (i) households that do not own a personal vehicle, (ii) households in rented or owned housing, and (iii) households below and above the poverty line

Travel times by race/ethnicity, auto ownership and poverty status

46. To assign a one-way travel time to any given citizen of voting age in any given Census block, I followed the following deterministic algorithm. First, if the individual lives in a household with an auto available, he or she will be driven by another household member to the nearest EIC location, unless taking public transportation or walking is faster, in which case the faster of those alternative modes will be assigned. Second, if the individual lives in a household without an automobile, he or she will take public transportation if it is faster than walking, and will otherwise walk to the nearest EIC location. The need for an algorithm arises from two factors. First, there is uncertainty about both the location and the auto access of those who are citizens of voting age and who do not hold a photo identification card. Second, it is not possible to quantify the burden of requesting and obtaining assistance from a family member outside the home, a friend, or a co-worker, to drive the individual to an EIC location.

47. Using this algorithm, the fastest travel time between the home location (block group centroid) and the nearest EIC location was nearly always via driving. Of the 15,811 simplified home locations (block group centroids), in only one case was public transportation faster. In instances where an auto was not available, and public transportation was accessible,

public transportation was faster in most but not all cases: in 936 of the 6,973 cases (13 percent) in which an EIC location could be reached by transit, walking access was faster.

48. In order to evaluate the extent to which all Texas citizens seeking an EIC will encounter a travel burden in going to an EIC location, and in order to compare travel burden by race/ethnicity, I divided the voting age citizens of Texas into three groups based on the extent of their travel burden: those who in order to obtain a photo ID would have to travel ninety minutes or more, two hours or more, or three hours or more from home to the EIC location and back again. A round trip of more than 90 minutes is particularly significant because a trip of that length more than doubles the average amount of travel carried out per day by an individual in the state of Texas.

49. I performed this burden analysis using two scenarios:

- In the first version ("scenario 1"), I assumed that in Texas citizens without an accepted photo ID are equally likely to live in an household without an automobile as citizens generally. I consider this to be a conservative estimate of travel burden because individuals without an accepted photo ID – and thus, without a driver's license – are more likely than the population generally to reside in households without a car available. Accordingly, scenario 1 examines the numbers and in-group percentages of persons who would travel round trip 90 minutes or more, two hours or more, and three hours or more by relying on both those who travel by car and those who would travel by public transportation or by walking (I refer to the latter group as the "no car" group).
- In the second version ("scenario 2" below), I assumed that relatively few citizens of voting age without photo IDs live in households not owning their own autos, and that

for those voting-age citizens without photo IDs who do live in a household with an auto, the burden of traveling by car to an EIC location is not meaningfully large compared to the burden of traveling by transit or on foot. Accordingly, scenario 2 examines the numbers and in-group percentages of persons who would travel round trip 90 minutes or more, two hours or more, and three hours or more. by relying in the numerator only on the data for those who would travel by public transportation or by walking, while continuing (as in scenario 1) to rely in the denominator on data for all citizens of voting age in the applicable subgroup.

- Neither of these two scenarios can be entirely correct, but they provide boundaries on the possible effects of the actual spatial distributions and modal distributions of those without photo ID upon the relative burden of the photo ID requirement.

50. As it turns out, and as I show below, Blacks have the highest burden and Hispanics the second-highest burden regardless of which scenario is used, and regardless of whether a burden is defined as having to travel more than 90 minutes, two hours, or three hours round trip. I therefore simply show the 90 minute burden definition in the two graphs below, reflecting the percentage of CVAs who I estimate would have to travel 45 minutes or more each way to travel to the EIC location.

51. As set forth below, I also present the data for each scenario using two population groupings. First, data for the two scenarios are presented for all citizens of voting age in Texas. Second, I focus on citizens of voting age whose income is below the poverty level, because among this group any large amount of travel is not burdensome only in time terms but also in financial terms. The estimates of travel burden set forth in the first two scenarios for all citizens of voting age do not account for the fact that poor households are likely to experience the

required travel as a financial burden as well. They are therefore underestimates of the true burden of travel for Hispanic and Black citizens of voting age, who are much more likely to live in poverty, regardless of whether they own a car or not. Regardless, among both all CVAs, and among only CVAs in poverty, Blacks have the highest burden and Hispanics the second highest burden in comparison to non-Hispanic Whites.

All citizens of voting age, scenarios 1 and 2:

52. Scenario 1: Of the estimated 8.9 million White, non-Hispanic citizens of voting age, I estimate that about 8.7 million have access to a vehicle owned by the household ("Car"), and about 256,000 do not. Of the 8.7 million with a car available, about 57,000 have a round trip to access an EIC location of more than 90 minutes, and over 17,000 of those have to travel more than two hours by car, round trip, to access an EIC location. The remainder of Table 4 below can be read in the same way.

Table 4: Citizens of voting age (CVAs) in Texas, total and by race/ethnicity , whose travel to obtain an EIC would exceed 90m, 2h and 3h

Racial/ethnic group	Subgroup	Total	90 minutes or more	Two hours or more	Three hours or more
All	All	15,806,213	737,841	596,102	418,879
	Car	15,054,163	79,092	25,213	12,850
	No Car	752,050	658,749	570,889	406,029
White. Non-Hispanic	All	8,922,732	290,260	228,458	177,900
	Car	8,667,192	56,568	17,497	9,028
	No Car	255,541	233,691	210,962	168,872
Black	All	2,022,070	219,764	188,745	120,154
	Car	1,781,853	847	251	117
	No Car	240,218	218,917	188,494	120,037
Asian	All	443,816	9,358	8,179	5,289
	Car	433,645	417	63	40
	No Car	10,170	8,941	8,116	5,249
Hispanic/Latino	All	4,184,116	209,577	161,808	104,884
	Car	3,947,414	21,129	7,356	3,423
	No Car	236,702	188,448	154,452	101,461

53. In order to evaluate proportional burden among these racial/ethnic groups, the figures in the table above can be translated into within-group percentages. In Table 5 (below), the share of each racial/ethnic group with travel times exceeding 90 minutes, two hours, and three hours round-trip is shown, both for the racial ethnic group as a whole, as well as within the car-owning and the non-car-owning populations (shaded rows). The “all” lines are computed by dividing the number of households with round trips exceeding 90 minutes, 2 hours, and 3 hours by the total number in that racial/ethnic category. These percentages, in the white rows, refer to all households regardless of auto ownership.

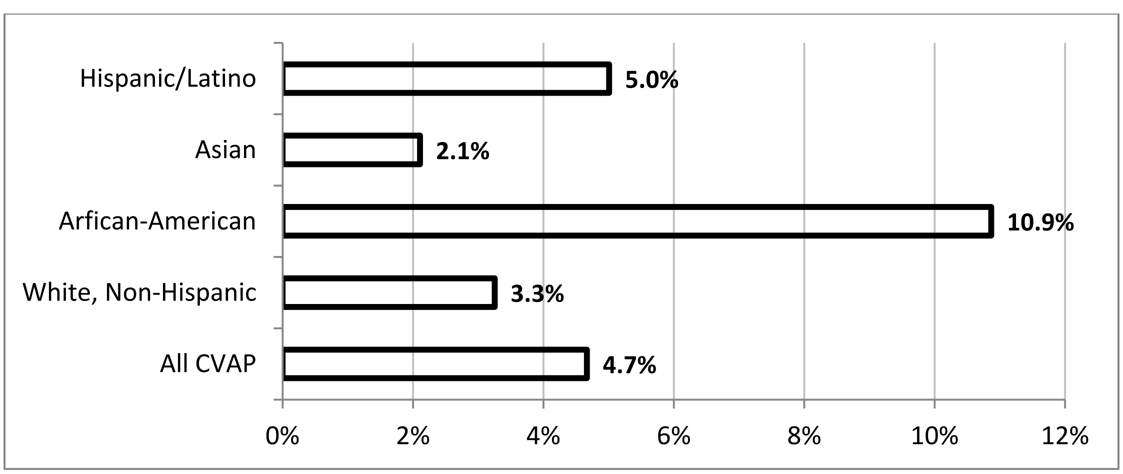
54. The two shaded rows below each “all” row show respectively, among CVAs with cars in their household and CVAs without cars, the percentage who have round trips exceeding the same time thresholds. It is helpful in understanding the calculations of overall burden that appear in the “All” rows, in white, that among CVAs living in car-owning households—97 percent of non-Hispanic White, 88 percent of Black, 98 percent of Asian, and 94 percent of Hispanic/Latino CVAs—there is a very low share of people who have to travel more than 90 minutes round trip to access an EIC location. In stark contrast, very large majorities of citizens of voting age living in households without cars are unable to access a EIC location within two or three hours, round trip, via public transportation or walking. This is true regardless of race/ethnicity, but higher percentages of Black and Hispanic citizens of voting age live in households without an auto available – 12 and 6 percent respectively, compared to 3 percent of non-Hispanic Whites.

Table 5: CVAs by race/ethnicity and total, percentages whose travel to obtain an EIC would exceed 90m, 2h and 3h: all, with a vehicle in the household, and without a vehicle in the household

Racial/ethnic group	Subgroup	90 minutes or more	Two hours or more	Three hours or more
All	All	4.7%	3.8%	2.7%
	Car (95%)	0.5%	0.2%	0.1%
	No Car (5%)	87.6%	75.9%	54.0%
White. Non-Hispanic	All	3.3%	2.6%	2.0%
	Car (97%)	0.7%	0.2%	0.1%
	No Car (3%)	91.4%	82.6%	66.1%
Black	All	10.9%	9.3%	5.9%
	Car (88%)	0.0%	0.0%	0.0%
	No Car (12%)	91.1%	78.5%	50.0%
Asian	All	2.1%	1.8%	1.2%
	Car (98%)	0.1%	0.0%	0.0%
	No Car (2%)	87.9%	79.8%	51.6%
Hispanic/Latino	All	5.0%	3.9%	2.5%
	Car (94%)	0.5%	0.2%	0.1%
	No Car (6%)	79.6%	65.3%	42.9%

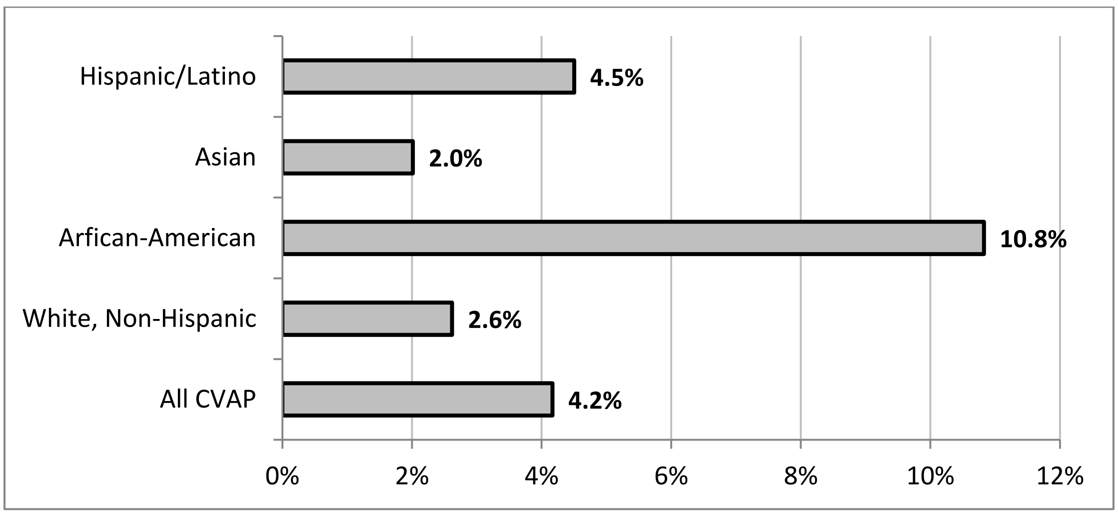
55. As indicated above, in scenario 1, about 11 percent of the Black citizen voting-age population must travel 90 minutes or more to access an EIC location, while Hispanics have the second highest burden, at 5 percent, compared to non-Hispanic Whites among whom 3.3 percent have travel times longer than 90 minutes (Figure 5). Under this 90-minute round trip definition, African Americans are 3.3 times as likely to have a burden as non-Hispanic Whites, while Hispanics are 1.5 times as likely.

Figure 5: Scenario 1, Share having to travel 90 minutes or more, by race/ethnicity



56. Scenario 2: Using this estimation procedure, the relative burden increases somewhat for Blacks and Hispanics, although the absolute shares are lower (Figure 6). Blacks are 4.1 times as likely as non-Hispanic Whites to have a round trip to access an EIC location exceeding 90 minutes of time on public transportation or walking, and Hispanics are 1.7 times as likely to have such a long round trip. Note that the Scenario 2 figures are simply the share of the total population in each racial/ethnic category that lives in households without vehicles (the "No Car" category) with a round trip greater than 90 minutes, divided by the total population in that group.

Figure 6: Scenario 2, Share having to travel 90 minutes or more, by race/ethnicity



57. I also investigated the share of the transit-taking population that must transfer once or more between buses, because transfers increase the complexity and difficulty of public transportation trips. Among those who have the option of taking public transportation and for whom this choice is faster than walking, a lower share of Blacks has a direct route (31 percent) in comparison to Hispanics and non-Hispanic Whites who are more similar to each other at 37 percent and 35 percent respectively (see Table 6).

Table 6: CVAs taking public transportation to and from EIC location, by race/ethnicity and number of transfers required

		Direct Route		One Transfer		Two Transfers	
	Total	**Count**	**Percent**	**Count**	**Percent**	**Count**	**Percent**
All CVAP	305,842	103,262	34%	187,256	61%	15,324	5%
White. Non-Hispanic	76,998	26,650	35%	45,501	59%	4,847	6%
Black	131,780	41,084	31%	85,000	65%	5,696	4%
Asian	5,614	2,195	39%	3,097	55%	322	6%
Hispanic/Latino	104,761	38,286	37%	61,634	59%	4,841	5%

Citizens of voting age below the poverty line, scenarios 1 and 2:

58. Using the same methods described previously, I estimate that the poverty rate for Black CVAs is 24.2 percent and for Hispanic CVAs 24.5 percent, compared to 9.5 percent of non-Hispanic Whites (see Table 8). The share of CVAs both living in households below the poverty line and not having access to a car is seven times as high for Blacks and almost four times as high for Hispanics as for non-Hispanic Whites, at 7.1 and 3.6 percent respectively, in comparison to 1.0 percent for non-Hispanic Whites.

Table 8: Percent of individuals below poverty threshold, with and without a car, by race/ethnicity

	Below poverty threshold	**Below poverty threshold, no car**
All CVAP	16.3%	2.5%
White. Non-Hispanic	9.5%	1.0%
Black	24.2%	7.1%
Asian	10.3%	0.9%
Hispanic/Latino	24.5%	3.6%

59. When estimating the share of the population in poverty that is likely to have a travel burden, I used the same methods described earlier. The results just for households in poverty are shown in Table 9, below.

Table 9: Poverty status CVAs by race/ethnicity, with and without vehicle, and subgroups whose travel to obtain an EIC would exceed 90m, 2h and 3h

Racial/ethnic group	Subgroup	Total	90 minutes or more	Two hours or more	Three hours or more
All CVAP	All	2,575,664	356,059	297,438	202,009
	Car	2,173,382	11,793	4,145	1,875
	No Car	402,282	344,266	293,293	200,134
White, Non-Hispanic	All	845,848	84,213	71,867	55,999
	Car	757,543	5,563	1,914	896
	No Car	88,305	78,650	69,953	55,103
Black	All	488,475	129,811	110,835	69,977
	Car	345,114	195	26	4
	No Car	143,362	129,616	110,809	69,974
Asian	All	45,922	3,196	2,718	1,477
	Car	42,002	62	2	2
	No Car	3,920	3,133	2,716	1,474
Hispanic/Latino	All	1,026,494	122,194	97,269	62,585
	Car	877,156	5,139	1,894	865
	No Car	149,339	117,054	95,375	61,720

60. These figures can be translated again to the share of the racial/ethnic groups bearing a travel burden, under the same two scenarios as defined previously. Figures 7 and 8 below are the same as Figures 5 and 6, except that they apply only to the population of people who are in poverty in each racial/ethnic group. The remarkable fact about these results is that even when controlling for poverty, the burden is still substantially higher for Blacks and Hispanics than for non-Hispanic whites, suggesting that indeed, the burden is associated with race/ethnicity regardless of income. Although the rate of travel burden is indeed much higher for all CVAs living in households below the poverty threshold, it is higher for Hispanic CVAs in poverty (about 12 percent) than for non-Hispanic White CVAs in poverty (10 percent), and much higher for Black CVAs in poverty (almost 27 percent).

Figure 7: Scenario 1P, Share having to travel 90 minutes or more, by race/ethnicity

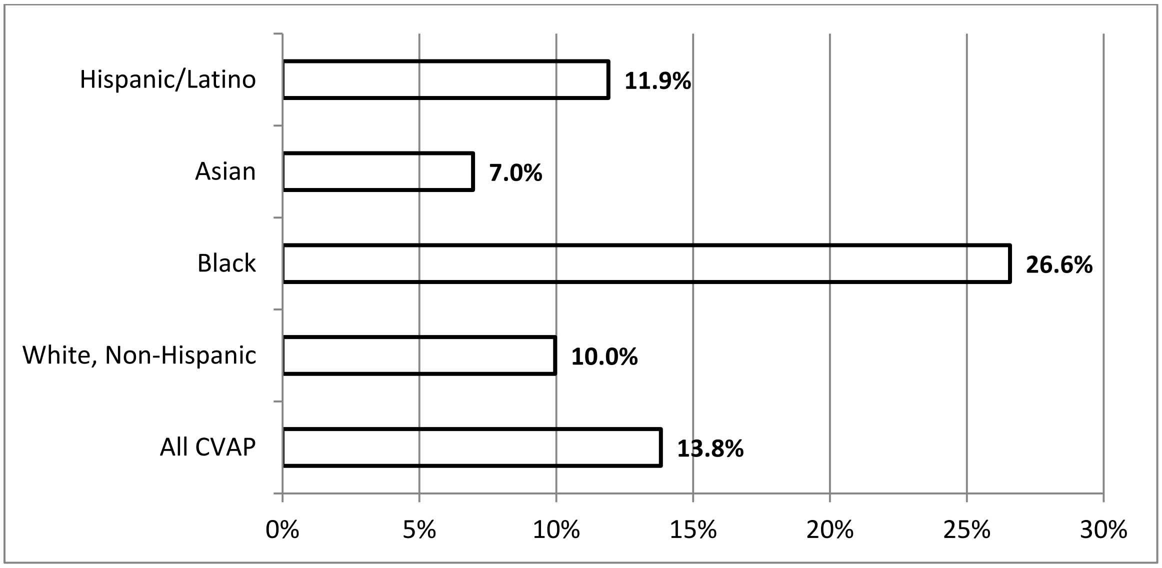
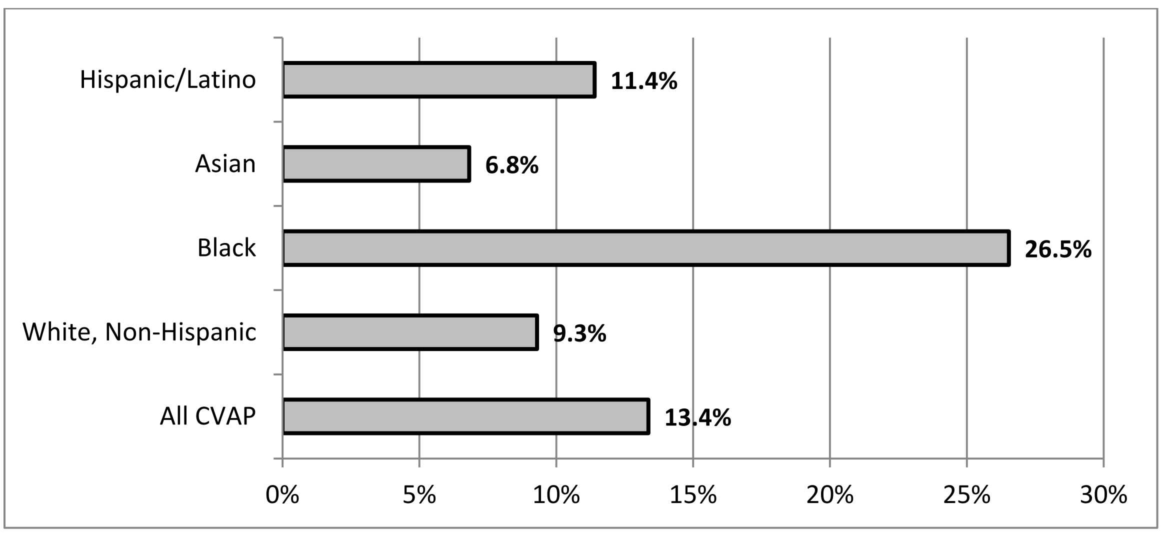


Figure 8: Scenario 2P, Sharing having to travel 90 minutes or more, by race/ethnicity



Conclusion

61. I find significant differences in travel burden by racial/ethnic category and also according to poverty level. Even when considering poverty, there is still a racial impact. In fact, poorest minorities are likely to be most affected by the travel needed to obtain an EIC. It takes a long time to access EIC locations by public transportation or on foot, regardless of the race/ethnicity of citizens of voting age (CVAs). More than 90 percent of CVAs in all racial

groups without a car would have a long trip to an EIC location, whether on foot or via transit. The main difference between the travel time burden for non-Hispanic White, Black, and Hispanic CVAs in the state of Texas is primarily the share that is likely to have to rely on public transportation or walking. About one in ten African American CVAs, and one in twenty Hispanic CVAs, does not have an auto available in their household, as compared to just one in 33 white CVAs, and the likelihood of auto ownership is lower still for those in poverty. Walking or using public transportation is generally much less convenient than driving in the state of Texas, and there is about one EIC location for every 90,000 people in the state. Given these facts, the relative rates of auto ownership among racial/ethnic groups practically predetermine the conclusion that the burden of the State of Texas photo ID requirement falls disproportionately upon African Americans and Hispanics, and is particularly high for the poorest citizens.

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I declare under penalty of perjury under the laws of the United States that the foregoing is true and correct to the best of my knowledge. This Declaration was executed on July 8, 2014 in Berkeley, California.

Daniel G. Chatman

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